



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|-------------|----------------------|---------------------|------------------|
| 10/039,663 | 10/22/2001 | Taylor R. Efland | TI-30955 | 9434 |

23494 7590 10/08/2003

TEXAS INSTRUMENTS INCORPORATED
P O BOX 655474, M/S 3999
DALLAS, TX 75265

EXAMINER

ANDUJAR, LEONARDO

ART UNIT PAPER NUMBER

2826

DATE MAILED: 10/08/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/039,663

Applicant(s)

EFLAND ET AL.

Examiner

Leonardo Andújar

Art Unit

2826

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.


- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 21 April 2003.
- 2a) ☒ This action is FINAL. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-5, 7-9, 11, 13-23 and 29-34 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 29-34 is/are allowed.
- 6) ☒ Claim(s) 1-5, 7-9, 11, 13 and 20-23 is/are rejected.
- 7) ☒ Claim(s) 14 and 16-19 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.


NATHAN J. FLYNN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☒ The proposed drawing correction filed on 21 April 2003 is: a) ☒ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s) _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

Election/Restrictions

1. Applicant's election without traverse of Group I (claims 1-23) in Paper No. 3 is acknowledged.

Drawings

2. The proposed drawing correction and/or the proposed substitute sheets of drawings, filed on 04/21/2003 have been approved. A proper drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The correction to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.
4. Claim 2 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.
5. Claims 2 recites the limitation "resistance of less than 1.5 mΩ/□" in lines 2 and 3. The symbol "□" is not based on any standard.

Claim Rejections - 35 USC § 102

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

Art Unit: 2826

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

7. Claims 1 is rejected under 35 U.S.C. 102(b) as being anticipated by Yamasaki et al. (US 5,973,554).

8. Regarding claim 1, Yamasaki (figs. 1-5) shows an integrated circuit chip 71 mounted on a lead frame (61-65) comprising a network distribution lines 5 deposited on the surface of the chip, located directly over active component 70 of the circuit. As shown in figure 5 the lines are conductively and vertically connected to the active components below the lines. Also, the lines are connected to a lead frame 62 by conductors 66 (e.g. fig. 1). The majority of the lines patterned as straight lines between the vias and the conductors respectively, thereby minimizing the distance for power delivery between a selected segment and one or more corresponding active components.

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

10. Claims 2 and 3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yamasaki et al. (US 5,973,554).

11. Regarding claim 2 (as understood), Yamasaki shows most aspects of the instant invention, including an integrated circuit having a low interconnection resistance (col.

5/lls. 16-65). Nonetheless, Yamasaki does not disclose that the lines are fabricated with a sheet resistance of less than 1.5 mΩ. The specific sheet resistance claimed by applicant, i.e., 1.5 mΩ, absent any criticality, is only considered to be the "optimum" sheet resistance value of the metal lines disclosed by the Prior Art that a person having ordinary skill in the art would have been able to determine using routine experimentation based, among other things, on the desired accuracy, manufacturing costs, etc. (see *In re Boesch*, 205 USPQ 215 (CCPA 1980)), and since neither non-obvious nor unexpected results, i.e., results which are different in kind and not in degree from the results of the prior art, will be obtained as long as the metal lines are used as already suggested by the Prior Art.

12. In regards to claim 3, the claim language referring to parasitic electrical losses is considered functional language. Any functional language must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. In a claim drawn to a process of making, the intended use must result in a manipulative difference as compared to the prior art. *In re Casey*, 152 USPQ 235 (CCPA 1967); *In re Otto*, 136 USPQ 458, 459 (CCPA 1963). Moreover, Yamasaki discloses that voltage drop contributes to the device electrical losses (col. 5/lls. 16-65).

13. Claims 4-5, 7, 8, 11, 15, 20, 21 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yamasaki et al. (US 5,973,554) in view of Tani (US 5,468,993).

14. Regarding claim 4, Yamasaki (figs. 1-5) discloses a semiconductor device comprising;

- A semiconductor chip having a first and second surfaces;
- An integrated circuit fabricated on the chip first surface having an active components 70;
- A metal layer 4 protected by a mechanically strong, electrically insulating overcoat 6 having a plurality of metal filled vias 9 to make an electrical contact;
- A plurality of windows to expose the circuit contact pads;
- Electrically conductive films 5 deposited on the overcoat and patterned into a network of lines substantially vertically over the active components, the film is in contact with the vias 9 and having an outermost surface being non corrodible and metallurgical attachable metal;
- A lead frame (61-65) having a first plurality of segments providing electrical signal and a second plurality of providing power and ground;
- And electrical conductors 66 connecting the chip contact pads (P1-P5) and/or the connecting the network lines with the plurality of segments.

15. The network pattern distributes the power current and the ground potential (e.g. fig. 5). Yamasaki discloses that the chip is mounted on the lead frame. Nonetheless, Yamasaki fails to further specify that the semiconductor chip is mounted on a chip mount pad. Tani discloses that it is conventionally in the art to attach the semiconductor chip to a chip mount pad (col. 1/lls. 17-28). As shown in fig. 3 the second surface of the chip 3 is attached to the chip mount pad 1. It would have been obvious to one of

ordinary skill in the art at the time the invention was made to attach the second surface of the semiconductor chip to a chip mount pad as it is conventionally in the art as taught by Tani.

16. Regarding claim 5, Yamasaki discloses that the chip is made of silicon (col. 2/lis. 64-66).

17. Regarding claim 7, Yamasaki discloses that the circuit comprises multi-layer metallization made of aluminum (col. 8/lis. 9-51).

18. Regarding claim 8, Yamasaki discloses the claimed invention except for the use of silicon nitride, silicon oxynitride, silicon carbon alloys or polyimide for make the overcoat 6. It would have been obvious to one having ordinary skill in the art at the time the invention was made to use of silicon nitride, silicon oxynitride, silicon carbon alloys or polyimide for make the overcoat 6, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. In re Leshin, 125 USPQ416.

19. Regarding claim 11, Tani discloses that the semiconductor chip and the bonded portion are sealed by synthetic resin molding or molding (col. 1/lis.19-28). Tani does not specify the process used to make the encapsulation e.g. transfer molding process. Nonetheless, this limitation is considered a process limitation. Note that in product related claims only the final product is relevant, not the process of making such as transfer molding. Note that a "product by process" claim is directed to the product per se, no matter how actually made, In re Hirao, 190 USPQ 15 at 17. See also In re Brown, 173 USPQ 685; In re Luck, 177 USPQ 523; In re Fessmann, 180 USPQ 324; In re

Avery, 186 USPQ 161; In re Wertheim, 191 USPQ 90 (209 USPQ 554 does not deal with this issue); and In re Marosi et al., 218 USPQ 289, all of which make it clear that it is the patentability of the final product per se which must be determined in a "product by process" claim, and not the patentability of the process, and that an old or obvious product produced by a new method is not patentable as a product, whether claimed in "product by process" claims or not. Note that applicant has the burden of proof in such cases, as the above caselaw makes clear. See also MPEP 706.03(e).

20. Regarding claim 15, Yamasaki shows that the conductors/ metallurgical attachments are bonding wires.

21. Regarding claim 20, Yamasaki shows that the conductors are bonding wires.

22. Regarding claim 21, Tani discloses that the semiconductor chip is bonded to the leads radially disposed around the die pad with gold wires (col. 1/lls.19-28).

23. Regarding claim 23, Yamasaki shows that the network of lines is electrically connected to the segments that are suitable for outside electrical contact.

24. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yamasaki et al. (US 5,973,554) in view of Tani (US 5,468,993) in view of Applicant's Admitted Prior Art.

25. Regarding claim 9, Yamasaki in view of Tani shows most aspects of the instant invention. However, Yamasaki in view of Tani does not disclose that the lead frame is prefabricated from a sheet like material selected from a group consisting of copper, copper alloy, aluminum, iron nickel alloy or invar. However, this limitation is considered to be a process limitation. Note that in product related claims only the final product is

Art Unit: 2826

relevant, not the process of making such as a pre fabricated lead frame. Note that a "product by process" claim is directed to the product per se, no matter how actually made, In re Hirao, 190 USPQ 15 at 17. See also In re Brown, 173 USPQ 685; In re Luck, 177 USPQ 523; In re Fessmann, 180 USPQ 324; In re Avery, 186 USPQ 161; In re Wertheim, 191 USPQ 90 (209 USPQ 554 does not deal with this issue); and In re Marosi et al., 218 USPQ 289, all of which make it clear that it is the patentability of the final product per se which must be determined in a "product by process" claim, and not the patentability of the process, and that an old or obvious product produced by a new method is not patentable as a product, whether claimed in "product by process" claims or not. Note that applicant has the burden of proof in such cases, as the above caselaw makes clear. See also MPEP 706.03(e). In regards to the material used to make the lead frame, Applicant's Admitted Prior Art discloses that it has been common practice to manufacture single piece lead frames from thin sheets of metal. For reasons of easy manufacturing, the commonly selected starting metals are copper, copper alloy, iron nickel alloys and invar (pg 2/pp. 03). It would have been obvious to one of ordinary skill in the art at the time the invention was made to make the lead frame of Yamasaki in view of Tani of copper, copper alloy, iron nickel alloys or invar for easy manufacturing reasons as taught by Applicant's Admitted Prior Art.

26. Claims 13, 20 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yamasaki et al. (US 5,973,554) in view of Tani (US 5,468,993) in view of Wolf et al.

Art Unit: 2826

27. Regarding claim 13, Yamasaki in view of Tani shows most aspects of the instant invention including lines and contacts pads attached to the outside part by conductors 66. However, Yamasaki in view of Tani does not disclose that solder balls can be used as connection means. Nonetheless, the use of wire bonds or solder balls as connection means is considered an obvious design choice and it is not patentable unless unobvious or unexpected results are obtained from these changes. It appears that these changes produce no functional differences and therefore would have been obvious. Note *In re Leshin*, 125 USPQ 416. For example, the advantages of flip chip bonding (solder ball or C4) are: 1) the entire chip surface can be covered with solder bumps. In other words, bonding locations are not limited to the chip perimeter, thus more I/O capability is provided than by a perimeter interconnections on a die with the same size, and 2) the very short lengths of the chip to package interconnection paths minimizes their inductance (see Wolf pages 857-8). It would have been obvious to one of ordinary skill in the art at the time the invention was made to use solder balls to make the electrical connections of the device disclosed by Yamasaki in view of Tani in order to provide more I/O capability and to minimizes the inductance as taught Wolf.

28. Regarding claim 20, Yamasaki in view of Tani shows most aspects of the instant invention including bonding wires conductors. However, Yamasaki in view of Tani does not disclose that solder balls can be used as connection means. Nonetheless, the use of wire bonding or solder ball connections is considered an obvious design choice and it is not patentable unless unobvious or unexpected results are obtained from these changes. It appears that these changes produce no functional differences and

therefore would have been obvious. Note *In re Leshin*, 125 USPQ 416. For example, the advantages of flip chip bonding (solder ball or C4) are: 1) the entire chip surface can be covered with solder bumps. In other words, bonding locations are not limited to the chip perimeter, thus more I/O capability is provided than by a perimeter interconnections on a die with the same size, and 2) the very short lengths of the chip to package interconnection paths minimizes their inductance (see Wolf pages 857-8). It would have been obvious to one of ordinary skill in the art at the time the invention was made to use solder balls to make the electrical connections of the device disclosed by Yamasaki in view of Tani in order to provide more I/O capability and to minimize the inductance as taught Wolf.

29. Regarding claim 22, Wolf discloses that the can be made of tin/lead alloy (pages 857-8).

Allowable Subject Matter

30. Claims 29-34 are allowed.

31. Claims 14 and 16-19 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Response to Arguments

32. Applicant's arguments filed 04/21/03 have been fully considered but they are not persuasive.

33. Initially, the symbol "□" is not based any standard unit system used in the art. The use of nonstandard unit system makes the claim unclear and confusing.

34. Applicant argues that Yamasaki does not disclose an active component. Nonetheless, the device disclosed by Yamasaki includes active components such as MOS transistor (abstract). Applicant argues that the element 70 disclosed by Yamasaki is a capacitor. It is respectfully noted that Yamasaki clearly teaches that the element 70 is a MOS transistor (col. 8/lis. 15-19).

35. In response to applicant's argument that Tani is nonanalogous art, it has been held that a prior art reference must either be in the field of applicant's endeavor or, if not, then be reasonably pertinent to the particular problem with which the applicant was concerned, in order to be relied upon as a basis for rejection of the claimed invention. See *In re Oetiker*, 977 F.2d 1443, 24 USPQ2d 1443 (Fed. Cir. 1992). In this case, Yamasaki and Tani are in the field of applicant's endeavor (i.e. semiconductor devices).

Conclusion

36. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

37. A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

Art Unit: 2826

38. Papers related to this application may be submitted directly to Art Unit 2826 by facsimile transmission. Papers should be faxed to Art Unit 2826 via the Art Unit 2826 Fax Center located in Crystal Plaza 4, room 3C23. The faxing of such papers must conform to the notice published in the Official Gazette, 1096 OG 30 (15 November 1989). The Art Unit 2826 Fax Center number is **(703) 308-7722** or **-7724**. The Art Unit 2826 Fax Center is to be used only for papers related to Art Unit 2826 applications.

39. Any inquiry concerning this communication or earlier communications from the examiner should be directed to **Leonardo Andújar** at **(703) 308-0080** and between the hours of 9:00 AM to 7:30 PM (Eastern Standard Time) Monday through Thursday or by e-mail via Leonardo.Andujar@uspto.gov. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nathan Flynn, can be reached on (703) 308-6601.

40. Any inquiry of a general nature or relating to the status of this application should be directed to the **Group 2800 Receptionist** at **(703) 305-3900**.

41. The following list is the Examiner's field of search for the present Office Action:

| Field of Search | Date |
|---|-------|
| U.S. Class / Subclass (es): 257/207, 208, 209, 691, 666 | 06/03 |
| Other Documentation: | |
| Electronic Database(s): East (USPAT, US PGPUB, JPO, EPO, Derwent, IBM TDB) | 06/03 |

Leonardo Andújar

Patent Examiner Art Unit 2826

LA

6/28/03